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AN IMPROVEMENT OF THE TECHNOLOGY OF CONTINUOUS MOLDING OF CERAMIC INSULATORS WITH SPIRAL RIBS

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New technical solutions in the technology of molding rod insulators with spiral ribs extruded from a vacuum press are considered. Positive results are obtained in a comparative trial of the insulators with spiral and ring ribs.

Electric insulators are intended for fixing and insulation of the current-conducting parts and act as mechanical supports and electrical barriers. It is known that as the voltage category grows, the mechanical loads on the support insulation of electrical equipment significantly grow. Thus, starting with a voltage class of 330 kV or more, single columns made up of ceramic rod insulators do not withstand the mechanical load. For instance, the bending destruction moment of the supporting-insulating structure for a VVBK-500 air switch should be at least 930 N · m, and the moment for an isolator intended for 1150 kV should be 3500 N · m, etc. [1].

The pyramidal and prismatic insulating structures composed of ceramic rod insulators are very cumbersome, are labor-consuming in installation, consume a lot of metal, and are not reliable enough.

A more compact variant could be a supporting and insulating structure based on insulators of a large diameter with an inner cavity. However, such insulators have a small ratio of the current leakage path length to the insulator height and, accordingly, poor moisture-discharge characteristics. By producing hollow support insulators with a large ratio of the length of the current leakage path to the height of the insulator, it would be possible to significantly decrease the height of the supporting-insulating structures and thus lower the cost of the insulator equipment, reduce its size, and decrease the cost of the substations.

The contemporary economic situation has led the manufacturers of high-voltage insulators to set new goals, including those of improving the quality and decreasing the production cost. The latter can be accomplished by designing new electroceramic structures with complex-profile surfaces and special-shape surfaces [2]. One particular case of complex extended surfaces is a surface with spiral ribs. Such a surface as a rule is produced by turning dry blank pieces molded from an electroporcelain mixture on a lathe. When spiral-rib insulators are formed from plastic mixtures, the problem is to ensure their geometric parameters, i.e., preset profile and spiral rib spacing.

The advantages of the insulators with spiral ribs include the possibility of full mechanization and automation of molding by means of vacuum-press extrusion using simple mechanisms. Taking into account the design specifics of the insulator with spiral ribs and the favorable rheological properties of plastic porcelain mixtures (moisture 18 – 20%), a waste-free technology for continuous molding of spiral-rib insulators has been developed. A uniform and stable pitch of the spiral rib of each insulator is provided by systems synchronizing the rotation of the molding disk with the forward motion of the porcelain mixture exiting from the vacuum press. As the mixture was being extruded via the rotating molding disk, its velocity was measured, and the rotational speed of an adjustable drive of the molding disk was set in proportion to the mixture velocity (USSR Inventor's Certificate No. 856802).

Figure 1 shows the scheme of a unit adjusting the spiral rib pitch. This unit functions as follows. A molded article *3*

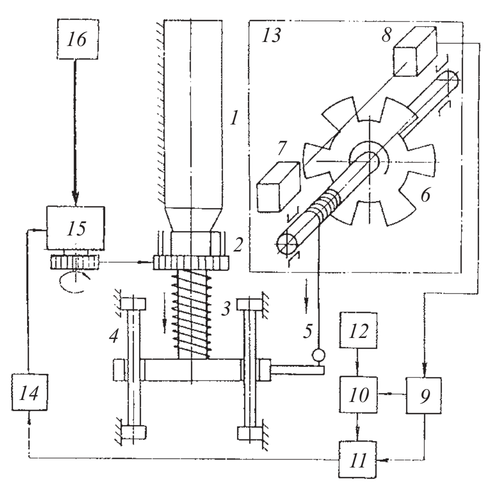

Fig. 1. Scheme of adjusting the spiral rib spacing.

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TABLE 1

Parameter	Insulator 3990*	
	serially produced	with spiral ribs
Weight, kg	5.0	4.7
Bending strength, N	3700	3750

* Length is 350 mm; outer diameter of the barrel is 90 mm; inner diameter is 50 mm; rib diameter is 142 mm, distance between ribs is 40 mm.

resulting after extrusion on the vacuum press *1* via the rotating molding disk *2* is supplied to a table *4*. The forward motion of the table repeats the nonuniform forward motion of the molded article. The motion of the table via a flexible filament *5* is converted into the rotation of a shutter *6*, which shuts the light flow from the light source *7*. The photo-pulse converter *8* converts the interrupted light flow into electric pulses. When these pulses arrive at the control block *9*, the latter forms zero-setting pulses to the meter *10* and stroke-setting pulses to the register *11*. The meter converts the number of pulses of the generator *12*, whose frequencies are significantly higher than the frequencies of the photosensor *13* pulses, into a code, which with each stroking pulse is transferred to the register, and the code-voltage converter *14* converts this code into voltage. The voltage from the converter arrives at the molding disk drive *15*, and the level of this voltage determines the varying rotational speed of the molding disk. The speed setter *16* sets the nominal value of the rotational speed of the molding, and the speed is adjusted with respect to this nominal value.

A compact high-voltage insulator with spiral ribs has been developed, whose dimensions and other parameters are equivalent to the insulator with ring ribs mass-produced at the Slavyansk High-Voltage Insulator Works. A batch of spiral-rib insulators was molded on an experimental machine from a working mixture of 18% moisture, glazed with a factory-produced transparent glaze, fired in a tunnel furnace, and tested according to the standard regulations. Table 1 lists the main parameters of the insulator with spiral ribs.

The considered system makes it possible to stabilize the spiral rib spacing for a wide interval of exit velocities of the porcelain mixture extruded from a vacuum press and ensures uniform rib spacing with an accuracy of $\pm$ 1.5 mm.

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